

IN THE UNITED STATES PATENT
AND
TRADEMARK OFFICE

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APPLICATION OF

JAMES VERNON CASE

FOR

UNITED STATES LETTERS PATENT

ON

TRANSMISSION ASSEMBLY TOOLS

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TRANSMISSION ASSEMBLY TOOLS

This invention relates to tools for the assembly of automatic transmissions. More particularly, but not exclusively, it relates to the automatic transmissions in Mercedes automobiles. The tools are usable with any transmission having similar elements assembled within the housing and not visible for protecting delicate parts when the related parts are mated under conditions during which critical parts can be deranged by assemblers actions when parts are moving into final positions.

BACKGROUND

During the repair of automatic transmissions, especially in the Mercedes automobile, some of the assembly is carried out with the transmission housing generally central axis in the vertical position, with the forward end facing upward. Some parts are placed in the housing, and further assembly is of such nature that the movements required may displace the previously assembled parts. The previously assembled parts cannot be inspected as assembly proceeds, or after it is completed, to assure the correctness of their positions.

The first assembled parts consists, in part, of a combination of seals and a thrust bearing ring that can cause very early failure of the transmission if they are compromised by disturbing assembly movements that occur after they are no longer visible. The problem is made more detrimental by the nature of the coming failure. The vehicle usually lasts a few miles before it has to be recovered and towed back for corrective work.

There is a need for tools that enable the assembly of the troublesome internal parts before they are installed into the housing. The needs provide the objects of the invention.

1
2 **SUMMARY OF THE DISCLOSURE**

3 Tools are provided to retain the potentially troublesome assembly in an
4 assembled state, with the critical elements secured in position while the assembly is
5 inserted into the housing.
6

7 **BRIEF DESCRIPTION OF DRAWINGS**

8 The transmission parts shown in the formal drawings are only those influenced
9 by use of the assembly tooling. Any other parts of the transmission, and the housing,
10 if presented, are in simplified form. The total transmission is a complex and intricate
11 assembly that can confuse the purpose of the description and, if present, would add
12 little benefit in describing points of novelty.

13 Figure 1 is a side view, in cutaway, of the partly assembled transmission.

14 Figure 2 is a side view partly cut away of the components with assembly
15 problems.

16 Figure 3 is a side view, somewhat enlarged, of one of the more troublesome
17 parts.

18 Figure 4 is a side view, somewhat enlarged, of the most troublesome
19 component.

20 Figure 5 is a side view, partly cut away, of the components of fig. 2, with the
21 housing.

22 Figure 6 is a side view the components of fig 2 with tooling used to ease
23 assembly.

24 Figure 7 is a side view of the components of fig. 2 assembled with the tooling.

25 Figure 8 is a side view of the assembled transmission, with tooling still in
26 place.

27 Figure 9 is a side view, mostly in cut-away, of a combined form of tool
28 component.
29

DETAILED DESCRIPTION OF DRAWINGS

The drawings are formal but omit many details of the related transmission that contribute nothing to the description of the points of novelty. Only parts influenced by new tooling are shown.

Figure 1 shows the parts of the transmission assembled by prior art methods, or with the novel tooling, to present the relationships of components hard to assemble by prior art methods.

Housing 1 has a partition 1f that supports and fixes the positions of the oil bushing 4 which is the most troublesome part. Thrust washer 5 rests on the part 4 and is rotationally secured by a tang shown in fig. 3 which engages a hole (not shown) in the part 4. Clutch assembly 3 is then positioned as shown and has to be placed, by prior art, into the housing and is positioned to enclose the seal rings on the bushing 4 without the benefit of vision from the side as assembly takes place, see the rings 4a and 4b of fig. 4.

It is significant that the oil bushing has surface and fastener arrangements to mount the oil bushing on the housing. Other transmission parts supported by the bearing features of the bushing are related to the housing by way of the bushing.

Assembly 2 is then inserted along the general center line into the position shown. Assembly 2 consists of shaft 2b, planetary gear complex 2a, with engagement extension 2e, upwardly extending spline portion 2g, and finally input shaft 2h. The forward end of the transmission is upward. Assembly 2 is a complex mechanism made difficult to assemble by splines 2e which have to move through disc mating splines 3b (see fig. 2) one-by-one until the position shown is achieved. The splines and disc relationship is best shown by fig. 2.

Figure 2 shows the relationships of the troublesome parts of the transmission and more clearly shows the features that present little difficulty if visible from the side while the assembly takes place outside the housing. Clutch 3 is a drum containing a series of discs that have spline matching bores 3b. Starting with oil bushing 4, seal rings 4a and 4b are installed and washer 5 is put in place on the

1 bushing, with tang 5a in a mating hole (not shown) in bushing 4. The clutch assembly
2 is slipped on the bushing and over the seal rings which are observable without the
3 housing. The assembler normally grasps upper shaft 2h and rocks the shaft about to
4 encourage the entry of splines 2f into the mating splines 3b in each disc. That could
5 agitate the thrust washer 5 and risks rocking tang 5a out of the mating hole similar
6 to bolt hole 4d in bushing 4. By prior art methods, the thrust washer is not visible
7 but rather is well down inside the housing (not shown) that is part of the assembly
8 at that time. With the novel tooling, the washer can be observed and corrected if
9 necessary. The assembly is then ready to install but there is no provision for retaining
10 the parts axially while the assembly is placed in the housing. The threads 2c invite
11 the use of a retainer for holding the assembly intact after it is assembled outside the
12 transmission housing, and quite observable, as shown with tooling, which accepts
13 pilot 2d, in place by fig. 7.

14 Figure 5 shows the parts of fig. 2 distributed along the common center line CL
15 of the housing 1 and parts 4 and 5 are enlarged in figs. 3 and 4 to show some details
16 more clearly. Housing 1 has forward expansion 1c, the central opening 1b, rear
17 extension 1e and the support barrier 1f. The bushing 4 mounts in bore 1a and is
18 secured by cap screws in holes 1d. The transmission will operate some time with the
19 thrust washer deranged but will cause transmission failure after some miles of use.
20 There is a need to assemble all parts shown left of the housing before the assembly
21 is placed in the housing.

22 Figure 6 shows all parts left of the housing in fig. 5 and the novel tools needed
23 to secure the assembly together for assembly into the housing. The tools include
24 three parts, alignment spear T3, Spacer sleeve T2 and retaining spear T1. Spear T1
25 has threads T1b which engage threads 2c on the assembly 2. Room is provided in T1
26 to accept pilot 2d. Sleeve T2 is shown separate from spear T1 but can exist as an
27 extension on the end of T1. Extension 2b extends through bores 4e and T2a

28 Figure 7 shows the assembled parts, with the tools in place for insertion of the
29 entirety into the housing. All of fig. 7 is assembled outside the housing and the seals
30 and thrust washer can be observed during and after assembly to assure correctness

1 of the relationship of the parts. Alignment of the bolt holes of bushing 4 is assured
2 by spear T3. All tool parts are removed after the assembly is placed in the housing.
3 No juggling of the assembly is necessary after the assembly shown is properly
4 secured in the housing.

5 Figure 8 shows the assembly, prepared outside the housing, after insertion into
6 the housing but with the tools still in place. Forward assembly 6 is shown,
7 representing further preparation of the transmission, but is not part of the novelty
8 presented. Removal of spear T3 and installation of cap screws into holes 1d usually
9 precedes removal of tool parts T1 and T2.

10 Figure 9 shows a combined form of tool parts T1 and T2. The left end is
11 extended with the inside and outside dimensions of tool part T2.

12 These and other objects, advantages, and features of this invention will be
13 apparent to those skilled in the art from a consideration of this specification,
14 including the attached claims and appended drawings.

15 It will be understood that certain features and sub-combinations are of utility
16 and may be employed without reference to other features and sub-combinations. This
17 is contemplated by and is within the scope of the claims.

18 As many possible embodiments may be made of the tool set of this invention
19 without departing from the scope thereof, it is to be understood that all matter herein
20 set forth or shown in the accompanying drawings is to be interpreted as illustrative
21 and not in a limiting sense.